Radiometer Housing

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LONG-TERM GOAL

The long-term goal is to develop an Underwater Intelligent Sensor Protection System (UISPS) to eliminate long-term bio fouling of underwater radiometers, which would make extended, unmanned radiometric measurements possible.

OBJECTIVES

Implement modifications to the existing prototype system, verify performance by preliminary testing in laboratory, and deploy the system dockside at Woods Hole Oceanographic Institute.

APPROACH

This device consists of segment of a sphere, which houses the radiometer. A spherical optical glass completes the sphere. The composite sphere rotates within a flexible circular aperture/scraper, which is in light contact with the sphere. A cylindrical shell supports the sphere and the scraper. As the sphere rotates past the scraper, the bulk of the contaminants are removed. Continuing the rotation brings the optical window (and the rest of the sphere) into a cleaning solution and past a set of brushes and squeegees within the cylindrical shell. The cleaning cycle is complete when the sphere completes one full revolution and the optical glass reaches the 12 o'clock position again.

The frequency of cleaning, number of rotations per cleaning cycle, data sampling rate and frequency, and all other data acquisition and control parameters are adjustable for greater flexibility of the device. A bi-axial inclinometer has also been implemented within the sphere to provide reference tilt data.

During long term testing, an unprotected radiometer adjacent to UISPS will be used to verify the contamination extent as well as data.

WORK COMPLETED

Following tests conducted at Woods Hole Oceanographic Institute last year, a series of modifications and improvements became necessary. The modifications being implemented are two fold. First, the glass window is being mechanically retained rather than being bonded to the sphere as long-term exposure to seawater softened the bond in the previous design. Second, the scraper is now flexible and in light contact with the sphere, thus conforming to the spherical surface and preventing small particles of sand to lodge themselves in the small gap between the scraper and the sphere. With the exception

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14. ABSTRACT
The long-term goal is to develop an Underwater Intelligent Sensor Protection System (UISPS) to eliminate long-term bio fouling of underwater radiometers, which would make extended, unmanned radiometric measurements possible.

15. SUBJECT TERMS

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of the components that are currently being machined, a complete prototype system exists. The main computer for data acquisition and control, the interface printed circuit board and all other electric and electronic components exist and are in working order.

RESULTS

The system was tested in the laboratory and subsequently deployed dockside at Woods Hole Oceanographic Institute. The operation of the system was monitored via the World Wide Web. The operation of the system ceased after nearly a three-week period due to lodged sand particles between the scraper and the sphere. The design of the interface between the sphere and the scraper has since been modified and is currently being implemented. Despite the premature failure of the system, and severely bio fouled housing, the glass window and the sphere were clean when the system was recovered for modifications.

IMPACT/APPLICATIONS

This system will considerably enhance the quality of the underwater radiation measurements and reduce hardware maintenance costs by keeping the sensor clean and free of biological growth. Furthermore, the longevity of measurements will be greatly improved in comparison to current deployments.

TRANSITIONS

The system will be utilized by researchers as part of an existing mooring along with other oceanographic instruments, or as a standalone unit to make long-term underwater radiometric measurements.

RELATED PROJECTS

During the deployment phase of the SHEBA program in September 1997, SSI personnel deployed eight of the Arctic ISPS [1] units in satellite sites as far as 50 Km from the main ice camp. These units worked flawlessly for one full year, as intended. In October 1998, they were recovered, and one site re-deployed. Further information and deployment photographs are available on SSI's web page [2].

A marine version of the ISPS has also been developed and tested aboard WHOI's R/V Oceanus. This version was intended to be integrated into the meteorological sensor package as part of the Moriah program.

REFERENCES

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